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The bicircular attoclock

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The attoclock technique [1] in which the emission time of a photoelectron is mapped to its detection angle is an important tool in strong-field ionization of atoms. However, the use of close-to-circularly polarized laser fields is inherent to the method and all conclusions drawn from the attoclock are stricly valid only in this kind of orthogonal tunneling geometry, which is characterized by the eletric field being perpendicular to its derivative.

In this work we show how counter-rotating bicircular laser fields can be used in a new approach to attoclock experiments to probe the ionization process in parallel tunneling geometry, as it is the case for linear polarization. This is possible because the ratio of the two fields can be chosen in a way that the vector potential has aspects of the attoclock in the sense that time is mapped directly onto the photoelectron momentum distribution, but the shape of the electric field corresponds to three repitions of close-to-linearly polarized fields.

We present photoelectron momentum distributions calculated via solutions of the time-dependent Schrödinger equation and investigate shifts in these distributions with respect to a possible delay in ionization time using a trajectory-free method developed recently.

References:
[1] P. Eckle et al, Nat. Phys. 4, 565–570 (2008)

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